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INVENTORY POLICIES OF FEED MILLS

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INVENTORY POLICIES OF FEED MILLS

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The purpose of this study was to evaluate inventory policies of feed mills and to learn something about their impact on operating efficiency. To this end data were collected on capital invested in inventories, storage space necessary for normal stocks, the annual rate of stock turnover, and the risks inherent in maintaining an inventory.

A report entitled "Inventory and Hedging Policies of Commercial Mixed-Feed Manufacturers in the United States" 1/ indicates that in 1948 and 1949 the limiting of inventories was by far the most important method used to minimize or shift inventory risks. The 1948-1949 study also indicated that hedging, purchasing "on limits" or "on basis" and making forward sales were other less frequently used methods of minimizing or shifting inventory risks. Therefore, only inventory size is analyzed in the present report and no attempt has been made to analyze the less frequently used practices.

The data summarized and analyzed in the present report were obtained as related but incidental information during a survey designed to analyze the costs of operating feed mills. The main features of this survey were published by the United States Department of Agriculture, as Marketing Research Report No. 79. 2/ While the information obtained did not yield all facts necessary for a comprehensive analysis of inventory policies, it did reveal the policies followed and the magnitude of the problem, and also permitted some observations on the trends in inventory policies.

Highlights of this Report

1. Only a half dozen of the companies that supplied data held stocks large enough to indicate concern over their ability to obtain adequate supplies, or a policy to take advantage of market price changes.

1/ Irwin, H. W., and McDonald, E. M. Inventory and Hedging Policies of Commercial Mixed-Feed Manufacturers in the United States. 45 pp. U. S. Dept. Agr. Inf. Bul. 24, Sept. 1950.

2/ Brensike, V. J., and Askew, W. R. Costs of Operating Selected Feed Mills. 45 pp. U. S. Dept. Agr. Market. Res. Rpt. 79, Feb. 1955.

2. Most inventories were held in ingredients. Almost all companies, large or small and irrespective of geographic location, maintained less than 5 days' supply of finished feeds.

3. Maintaining hand-to-mouth or minimum inventories, which was the modal type of operation noted in the earlier report on inventories, appeared to become the policy in nearly all plants in 1953.

4. These minimum inventories of ingredients were about:

   a. A 5-week supply in small plants mixing less than 10,000 tons per year in both the surplus and deficit ingredient production areas. Inventories in these small plants were determined primarily by the desire of operators to make large lot purchases.

   b. A 2-week supply in plants mixing 10,000 to 74,999 tons per year and located in areas of surplus ingredient production.

   c. A 5-week supply in plants mixing 10,000 to 34,999 tons per year and located in areas of deficit ingredient production.

   d. A 3-week supply in deficit area plants mixing 35,000 to 74,999 tons per year.

   e. A 2-week supply in all plants, surplus and deficit areas, mixing 75,000 or more tons per year.

5. Inventory policies were much more uniform in those plants located in areas of surplus production of ingredients.

6. Average storage space and inventory investment ranged from 500 tons and $42,000 in plants mixing less than 10,000 tons per year to nearly 6,500 and $550,000 in plants mixing 75,000 or more tons per year.

7. Small feed mixers tended to turn their inventories over about 10 times per year and large ones about 25 times per year.

The economic conditions influencing the supply and demand for feed ingredients, prior to and during the period studied, must be kept in mind when considering these inventory policies. This survey was conducted during 1953, a year of near-record supplies of many of the major feed ingredients. The period immediately preceding it was also characterized by large supplies of most of the major ingredients, and plant managements had little need to fear a shortage.

Summary of the 1947-49 Survey 3/

In contrast, this earlier survey (see footnote 1) covered a period which had been preceded by a number of years of sharply changing supplies of feed ingredients. Frequently, as was the case in 1947, feed supplies, especially corn, were short, and one of the main concerns of the industry was to obtain adequate supplies.

Although the study indicated that only a relatively small proportion of the companies attempted to stock up on ingredients when prices were considered low, considerable corn was purchased in 1948 at less than the CCC loan value in expectation of price increases. These sharply changing economic conditions undoubtedly influenced the inventory policies of the companies.

1. Feed manufacturers tended to hold inventories in ingredients rather than in finished feeds.

2. Although there was considerable variation and some companies held large stocks of ingredients, on the average, price risks of feed manufacturers resulting from an accumulation of ingredient inventories in excess of immediate needs were moderate.

3. Only a few companies "hedged" or bought ingredients "on limits" or "on basis" and very little feed was sold on forward sales as protection against price changes.

4. The effect of related or sideline departments on the inventories of the companies was not significant.

5. The primary reason given for holding low stocks was the desire to avoid risks of losses due to price declines, although the lack of appropriate storage was mentioned by a few companies. Financial resources appeared to have little bearing.

6. The reasons given for holding large stocks were (a) to purchase ingredients at favorable prices, (b) to get ingredients with particular qualities, and (c) in deficit areas, to accumulate locally produced grains and assure adequate supplies.

7. Companies mixing more than 500,000 tons per year or less than 10,000 tons per year held materially larger stocks of all ingredients in relation to output.

3/ The inventory policy findings were based on reports obtained from the 86 companies cooperating in the study, operating in 5 different areas of the United States and varying in volume of feed mixed from some of the smallest to some of the largest.

8. Among the 5 regions studied, the combined stocks of 15 ingredients were much larger, in relation to output, in the Midwest than in the other 3 regions east of the Rocky Mountains but only slightly larger than in the Pacific Region.

9. The most popular practice throughout the country was a hand-to-mouth policy with stocks slightly above the minimum. Generally speaking, minimum inventories in the Midwest were a 1-week supply of grain and a 2-week supply of the other ingredients, including quantities in transit. Minimum inventories in the other areas were about a 3-week supply because of the additional transit time required.

Methodology

The original plant sample and the plants cooperating in the survey were determined on the basis of the objectives of the cost study and the operators' willingness to supply cost data. Thus, some of the cooperating plants did not supply inventory data. One of the primary purposes of the cost study was to contrast operating costs in typical plants with different volumes. The sample included larger plants at a greater sampling rate. In view of this fact, the present analysis was made on the basis of operating volume group averages rather than on the basis of an industry average. 4/

The original cost survey covered the operation of 126 feed mills operating in the Middle Atlantic, Southern, Midwest, and Pacific regions of the United States. Sample and alternate plants were chosen at random within volume and geographic location strata. Between 22 and 35 plants cooperated in each of these regions and were fairly evenly distributed within each region over the operating volume area of from 1,000 to over 100,000 tons of feed mixed per year. All of the field contacts were completed during the period July 1 - December 1, 1953.

Eighty-five of these cooperating feed milling plants supplied information on the tons of feed mixed, dollars invested in inventories, and tons of ingredients and finished feeds normally held in storage. These plants were distributed among operating volume groups as follows:

4/ In order to show more clearly the underlying pattern of the different inventory policies used in plants of different volumes, the plants were combined into slightly altered volume groups from those used in the cost study. Since the changes resulted in larger groupings rather than smaller ones, the validity of the finding should not have been influenced.

Annual volume of feed mixed	Number of plants
Under 1,000 tons	33
10,000 - 34,999 tons	28
35,000 - 74,999 tons	19
75,000 tons and over	5
Total	85

In order to learn more about how the inventory policies differ in plants located in ingredient surplus and deficit areas, the Midwestern area was considered as a surplus area and all others as deficit areas. It was recognized that an individual plant in a predominantly deficit area may be located in a spot where most of the ingredients are in surplus. A reverse situation is also a possibility but not nearly as probable. The sample in the Midwest, or surplus area, was located in and around Iowa, the heart of the feed grain and meal production area. All studies of ingredient and concentrate feed movement indicate that this is the major surplus area while the Mid-Atlantic, Southern, and Pacific areas are considered deficit areas. 5/ 6/

Importance of Seasonality

Feed milling no longer can be characterized as a seasonal industry. Ingredient production, however, frequently takes place during a comparatively short period each year. This creates the problem of seasonal storage and risk taking.

Grains are produced in the summer and fall. A major proportion of the commercially used grain of each type reaches the market during a 3-month period. As a result, commercial stocks vary considerably from the low to the peak month. About 80 percent of the fish meal and 70 percent of the alfalfa meal are produced during a 6-month period. Much of the soybean meal is sold for future delivery by the crushers early in the season.

5/ Askew, W. R. and Brensike, V. J. The Mixed Feeds Industry. Marketing Research Report No. 28, U. S. Dept. Agr. May 1953, pp. 18-19.

6/ Jennings, R. D. Feed Consumed by Livestock. Statis. Bul. No. 145, U. S. Dept. Agr. June 1954, pp. 16-21.

On the other hand, the feed-milling industry as a whole uses ingredients at a fairly steady rate throughout the year. Records of the American Feed Manufacturers Association 7/ indicate that during each of the last 3 years the high production month was only about 20 percent above the production during the low month. The trend toward less seasonality seems to be continuing since during the 1947 and 1948 seasons the high month was 30 percent above the low.

Many individual plants, however, have a much more pronounced seasonal production pattern. A number of plants cooperating in the cost study reported increases of more than 200 percent in production from the low to the high month. These increases from the low to the high month averaged 60 percent in plants mixing less than 5,000 tons per year and 58 percent in plants mixing 45,000 or more tons per year.

One of the reasons seasonality evens out for the industry as a whole while it varies considerably in individual plants is that there appears to be no general seasonal pattern among individual plants until a volume of 35,000 tons a year is achieved. Plants mixing more than 35,000 tons a year tend to have their high production months in the late spring and early summer and their low production months in the winter. Almost as many of the smaller plants had high production months in the winter as had them in the late spring or early summer.

According to feed department managers, no attempt was made to store large amounts of ingredients from the brief period during which they were produced to the other months of formula feed production. Feed mill managers tend, at least during periods of large supplies, to let this storage and risk function be performed by other handlers and operate their feed-milling establishments with a minimum inventory. Seasonality of formula feed production is, however, an important consideration since some of the following analyses are expressed in terms of the average day's production and the representativeness of an average day's production is dependent upon the degree of the seasonality of production.

Seasonality of or shifts in first-of-the-month stocks of ingredients and finished feeds, if the variation is great, can be even more important since all of the following analyses are based on the normal or usual stock positions. The 1947-49 study indicated that during that period ingredient stocks in June (the low month) were about 65 percent of the ingredient stocks in December (the high month).

In the present study, normal stocks and beginning and ending inventories were obtained. These beginning and ending inventories did not show much change and production and sales, while they varied from month

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7/ Diamond, W. T., Executive Secretary, Amer. Feed Manufacturers Assoc. in a speech at the production conference of the Amer. Dehydrators Assoc., March 21-22, 1955.

to month, were almost identical in every month during the year. Thus, it appears that there were no very pronounced shifts in either ingredient or finished feed storage policies within any given plant during the period studied. In fact, most plant owners and managers implied that they tried to maintain normal stocks throughout the year, irrespective of changes in the seasonal production pattern. Thus, to the extent they were successful, the normal tonnage tended to remain more stable than the turnover rate or the ratio of stock to the current days' production. In this report the inventory turnover rates and the ratio of stock to daily production are based on annual averages but it should be remembered that these averages will tend to vary from season to season, decreasing as production increases and increasing as production decreases.

Size and Value of Inventories

Ingredients represent about 80 percent of the costs of manufacturing mixed feeds but this proportion varies considerably, depending upon the type of finished feed produced. Feed mill management is always interested in buying ingredients as economically as possible. In spite of this fact, only a few companies had normal stocks of a large enough size to have made any attempt to take advantage of price movements and to perform even a small additional part of the storage and risk function. This probably means that mill managers, at least in times of large ingredient supplies, have found that it does not pay to purchase large quantities of the major ingredients and hold them from one season to another. Apparently, a majority of them have found that managerial and labor time could be more efficiently used in finding better sources of ingredients and achieving more efficient production than by watching the market closely and turning, fumigating, and caring for grain and other ingredients in storage.

Normal inventory stocks seem to vary from about 500 tons in plants mixing less than 10,000 tons per year to about 5,900 tons in plants mixing 75,000 or more tons per year (table 1). The dollar value of these normal inventories varied from $42,000 to $550,000. These inventory dollar values equal about two-thirds of the companies' original investment in plant and equipment in the two smaller volume groups and about one-half of the companies' plant and equipment investment in the two larger volume groups.

Table 1.--Tons of ingredients and finished feeds and total inventory investments, by volume groups, 1952-53

Annual volume of production in tons	Average volume of production	Normal storage stocks		
		Average stock of ingredients	Average stock of finished feed	Total value
	Tons	Tons	Tons	Dollars
Under 10,000	4,405	434	52	42,116
10,000 - 34,999	19,434	1,311	233	137,769
35,000 - 74,999	50,094	2,337	471	244,374
75,000 and over	123,672	5,839	516	548,945

Nearly 90 percent of the tonnage held in inventories is held in the form of ingredients. Stocks of finished feeds are kept low enough to be considered working stocks (tables 3 and 4).

Most of the ingredients used in the manufacture of formula feeds are grain and oil meals and, therefore, most of the inventory stocks will also tend to be in grain and oil meals. The importance of the various ingredients in these normal storage stocks will, of course, vary somewhat depending on the price, supply, and demand picture, as well as their relative keeping qualities. However, table 2 shows the importance of the various ingredients in 1947 mixed feed formulas and contrasts this with the average stock position of each ingredient during the 1947-1949 period. Table 2 is a reproduction of table 5 from page 17 of "Inventory and Hedging Policies of Commercial Mixed-Feed Manufacturers in the United States, Agriculture Information Bulletin No. 24.

During this period at least, the "meals" appeared to be stocked in larger relative quantities and were turned over a fewer number of times per year than were grain and other ingredients.

Not only did the ratio of inventories to production decrease as the plants got larger, but the variations around the volume group averages decreased as the plants became large. This was true even though the volume span within each group increased in each successively larger volume group.

Finished feed inventories on the average did not exceed a 4-day supply and decreased to a 1-day supply in the larger plants (table 3). Concentration around these averages was also more pronounced than was the case

Table 2.--Relative consumption of specified feed ingredients in 1947 by mixed-feed industry, and average of maximum inventories of such ingredients held by 89 feed manufacturers in 1947-1948 and 1948-1949 1/

Feed ingredients	Consumption by mixed-feed industry 1947 2/	Maximum inventories held by 89 feed manufacturers, average of 1947-48 and 1948-49
	Percent	Percent
Grain:		
Corn, oats, barley, grain sorghums, wheat	45.0	37.0
Nongrain:		
Soybean meal	13.3	28.2
Fish meal	1.0	3.2
Linseed meal	1.1	2.6
Cottonseed meal	1.6	2.2
Alfalfa meal	5.7	5.7
Total nongrain ingredients	22.7	41.8
Other nongrain ingredients	32.3	21.2
Total	100.0	100.0

1/ Data of consumption of feed ingredients were not obtained in the study. This comparison assumes that the proportions utilized by the 89 feed manufacturers did not differ materially from those shown by the Census of Manufacturers for the prepared feed industry in 1947.

2/ Derived from data of 1947 Census of Manufacturers.

Table 3.--Average and range of ingredient, finished feed, and total stocks related to daily volume, by volume groups, 1952-53 1/

Annual volume in tons	Average volume	Ingredient stocks related to normal day's output		Finished feed stock related to a normal day's output		Total stocks related to a normal day's output
		Average	Range	Average	Range	
	Tons	Days	Days	Days	Days	Days
Under 10,000	4,405	30	6 - 75	4	0.0 - 16	34
10,000-34,999	19,434	23	4 -100	4	0.8 - 12	27
35,000-74,999	50,094	15	4 - 59	3	0.9 - 7	18
75,000 & over	123,672	14	1 - 38	1	0.1 - 2	15

1/ Computed on the basis of 306 work days per year. This assumes a 6-day week and closing on the major holidays.

of the ingredient averages. In analyzing the variations in inventories around the averages for each volume group, it became apparent that most of the extremes were reported by plants located in deficit ingredient production areas.

Table 4 shows how the range of ingredient and finished feed stocks vary among plants of similar volume, depending on whether they are located in areas of surplus or deficit ingredient production. It also shows how the 23-day average stocks in the 10,000 to 34,999 volume group, and to some extent the 15-day average in the 35,000 to 74,999 volume group, tend to cover up area differences apparently attributed to the location of plants in a surplus or deficit area of ingredient production.

Table 4.--Inventory comparisons for plants located in surplus and deficit areas of ingredient production, by volume groups, 1952-1953

Annual volume in tons	Average volume per plant	Ingredient stocks related to a normal day's output		Finished feed stock related to a normal day's output		Total stocks related to a normal day's output
		Average	Range	Average	Range	
	Tons	Days	Days	Days	Days	Days
Under 10,000						
Midwest	4,011	30.2	9 - 60	6.7	2.0 - 16	36.9
All other	4,734	29.2	6 - 75	2.5	0.0 - 12	31.7
10,000-34,999						
Midwest	18,759	1/ 10.7	5 - 18	3.6	0.9 - 7	14.3
All other	19,810	1/ 30.0	4 -100	4.2	0.7 - 12	34.2
35,000-74,999						
Midwest	57,182	2/ 10.2	9 - 12	3.3	2.0 - 6	13.5
All other	45,959	2/ 18.0	4 - 59	2.8	1.0 - 7	17.1
75,000 & over 3/						
All areas	123,672	13.7	1 - 38	1.2	0.1 - 2	14.9

1/ Less than 3 chances out of 1,000 that this difference is due to chance.

2/ Significant difference at the 5-percent level. Even more significant when trend between volume groups is considered.

3/ Area breakdown excluded to preclude possible disclosure of plant identity. No significant differences were disclosed between areas in these large plants.

It appears that the normal purchase policies of plants mixing less than 10,000 tons per year are such that the location of the plant in a deficit or surplus ingredient production area has little influence on inventory policy. In both instances, plant inventories average a 30-day

supply. The range of plants was also similar to both instances. Attempts to reduce ingredient costs through carload and other large lot purchases and the small volume of production seem to dictate the inventory policies of most small firms.

There also appears to be no significant difference between the inventory policies of firms located in deficit or surplus ingredient production areas when their volumes equal or exceed 75,000 tons per year. Apparently, these firms have a volume sufficient to keep given quantities of the various ingredients moving toward their plant at all times, irrespective of their location in reference to the source of ingredients.

Plants located in the area of surplus production and mixing between 10,000 and 74,999 tons per year kept only a 10- to 11-day supply of ingredients. However, plants mixing 10,000 to 34,999 tons per year located in areas of deficit ingredient production kept a 30-day supply of ingredients. This is the same number of days' supply as was held by plants mixing less than 10,000 tons per year, irrespective of location (table 4). Plants mixing between 35,000 and 74,999 tons per year and located in deficit ingredient areas reduced their ingredient supplies to an 18-day level. This is approximately one week's travel time more than the level maintained by plants of similar size in the surplus area.

Annual Inventory Turnover Rate

Converting these data into annual turnover rates, it can be noted that if the plant is located in an area of deficit ingredient production, it tends to turn over its inventory about 8 times a year if its volume is less than 35,000 tons; 18 times if its volume is between 35,000 and 74,999 tons, and 23 if it has a volume in excess of 75,000 tons per year.

Plants located in an area of surplus ingredient production tend to turn over their inventories about 8 times a year if their volumes are less than 10,000 tons per year, and 23 times if their volume is in excess of 10,000 tons per year.